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# Cobblestone Construction for Farm Buildings

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Cobblestones, broken by the forces of nature into handy sizes and somewhat rounded by long exposure to rain, snow and frost, are abundant in many parts of Missouri and offer many advantages for use in farm building construction. Whether the building be a roadside market, a farm home, barn or garage, cobblestones and concrete will be found suitable for its construction. Buildings so constructed are largely storm-proof and fire-resistant. Besides permanence and freedom from maintenance expense they have the further advantage of extremely low first cost, since stone, gravel and sand may usually be obtained locally, and the work can be carried on successfully without previous experience or special tools.

The stones require no special treatment except to be clean and in sizes easily handled. The wide range of colors and textures lends interest to the work. Sorting the stones for colorings and sizes affords unlimited possibilities for varying the final effect and expressing individual taste. Unevenly weathered faces, varied sizes and colors, and the irregular mortar joints all help to make this type of construction harmonize with the surroundings.

## Selecting the Rock

Usually most rock that has been lying on top of the ground or that has been exposed to the action of rain, snow and frost is suitable for building purposes. Such rocks as limestone, granite, marble, flint, etc. are very durable and are satisfactory for building purposes. The size and shape of the rock can vary within wide limits. If some are too large they can be broken with a sledge at the time of laying. If the rocks are dirty or covered with moss they should be cleaned before laying in the wall.

### Laying Out the Foundation

After the size and shape of the building have been determined, the next problem is to lay out the foundation. A practical method of laying out the foundation for a building is shown in Fig. 1. A base line establishing one side of the building as A-B, is marked off and nails are driven into the tops of the stakes to mark the exact corners of the building. On line A-B stake F is driven 6 feet from A. Stake E is then driven 10 feet from F and 8 feet from A. Nails are driven in the tops of stakes E and F. The measurements must be accurate so that the nails in the stakes are exactly 6, 8 and 10 feet apart. The corner E-A-F is, then, a right-angle triangle and therefore more accurate than the ordinary steel square. Side A-E extended will represent the side A-D of the building and the point D the third corner. The fourth corner C is located in a similar manner by the triangle method. Strings are then stretched over the stakes and carried to the batter

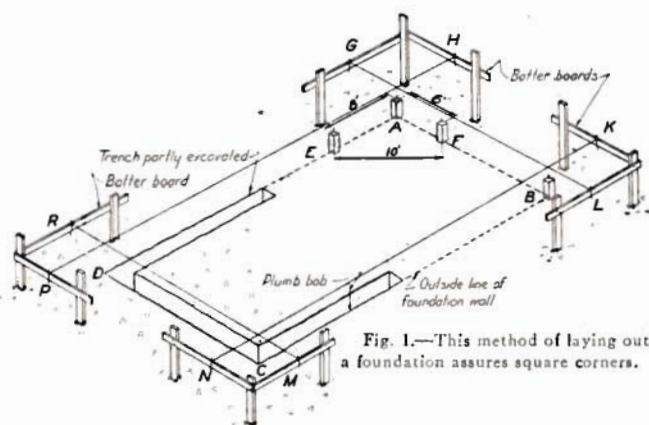


Fig. 1.—This method of laying out a foundation assures square corners.

boards as illustrated (GH, KL, MN, PR). The outline of the building having thus been determined the corner stakes are removed and the foundation is ready for excavation, either for trench or complete basement as the occasion demands. In making the excavation a plank laid flush with the outside edge of the proposed foundation wall will be a big aid in getting a straight excavation and in many cases will prevent the side walls from caving in.

### Footings and Foundation Walls

The footings and foundation walls for cobblestone buildings will have to be heavier than for wood buildings because of the additional weight of the building placed upon them. The width of the footings is also determined by the type of soil upon which they are placed. A soft loose soil will require a wider, stronger footing than a solid firm soil. Usually a footing 50% wider than the wall to be placed upon it is sufficient. Footings are usually made of concrete but if stone is available much of this material can be used. The best practice is to use a slushy

mix of concrete, place it in the footing and then place the rock in the concrete, being sure that each rock is well embedded. A slushy mix is obtained by using less sand and gravel per each sack of cement instead of adding more water. In mixing the concrete for the footings  $5\frac{1}{2}$  gallons of water per sack of cement should be used with moist sand and gravel. This will make a mix of about 1 part cement,  $2\frac{1}{2}$  parts sand, and 4 parts gravel. If the sand-gravel is dry use 6 gallons of water and if wet use only 5 gallons of water. In the construction of the foundation walls the above practices can be followed.

For mortar in the foundation wall above the footings the concrete mix should be a little richer, using only 5 gallons of water per sack of cement with medium dry aggregate. (Aggregate is the word commonly used for sand and gravel.) Here again much rock can be worked into the concrete after it is poured.

In many of the smaller types of buildings the cobblestone walls can be built up from the footing. In buildings having basements an inside form will be necessary. A common method of constructing the form is shown in Fig. 2. For buildings without basements, the sides of the foundation trench can be used for forms unless they cave readily in which case forms will have to be used. Studs used for supporting form sheathing consist of 2 by 4 or 2 by 6-inch material spaced not more than 3 feet apart to prevent any bulging of the finished wall. It is always a good policy to reinforce the corners of a foundation wall. Old wagon tires, angle iron and rods are good material for this purpose, however, they should be clean and free from loose rust. The reinforcing should be continuous around the corners for at least two feet and should be placed in the inside third of the foundation wall.

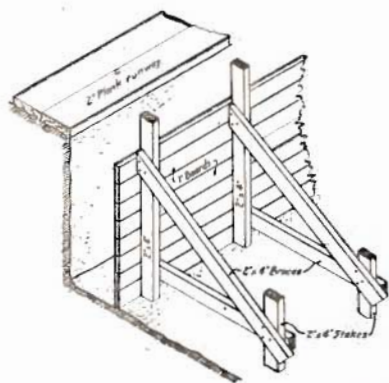


Fig. 2.—Forms for the foundation walls where the embankment serves as other form.

### Construction of the Cobblestone Walls

The first thing that must be done in the construction of the walls is to construct an inside form. No outside forms are needed. Two methods of building inner forms are in common use. In one method, used mostly in smaller buildings, the complete inner form is built before the masonry work is started (See Figure 3), and this method is recommended for the beginner. The studs supporting the sheathing should be set not over 3 feet apart and should be well braced to prevent bulging of the side walls.

The sheathing should be nailed to the studs only to hold it in place and the nails pulled as the walls are built up. This makes the forms easy to remove when the walls have hardened.

The other method of form construction is to use what is commonly called a movable form, see Figs. 4A, 4B and 5. With this method a few boards are used and moved up as the wall is laid. Boards having straight edges and surfaced on one side are recommended for this type of construction. The sides coming in contact with the concrete should be oiled to make removal easy. Old crankcase oil can be used for this purpose. In using a form of this type enough boards should be on hand to permit the work to proceed without interruption yet allowing the walls to acquire sufficient strength to stand alone. Boards 12 inches wide or more are preferable to narrower ones because they permit a greater height of wall to be built in one course.



Fig. 3.—Window frames and door frames are tacked on outside of forms.



Fig. 4A.—Strip in place behind form, showing nail which can readily be withdrawn allowing strip to be removed.



Fig. 4B.—Removing strip after nail has been pulled. This allows form to be taken off and raised.

To allow forms to be moved easily and without distributing the supports a removable strip is used as a backing of each stud and each corner. Any piece of 1 by 2 or 1 by 3-inch lumber two or three feet long

is suitable for the purpose except at corners where a 1 by 1-inch piece is used. When the corner strips and those on the studs are removed the form boards are easily loosened and raised without disturbing the studs.

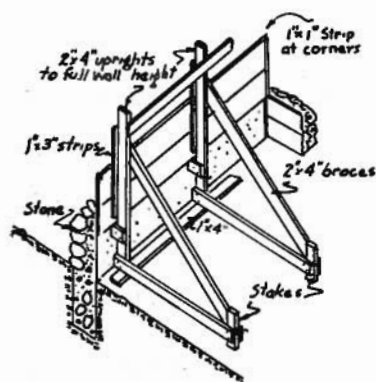


Fig. 5.—Note use of 1 by 1-inch corner strip which prevents form boards from binding at corners.

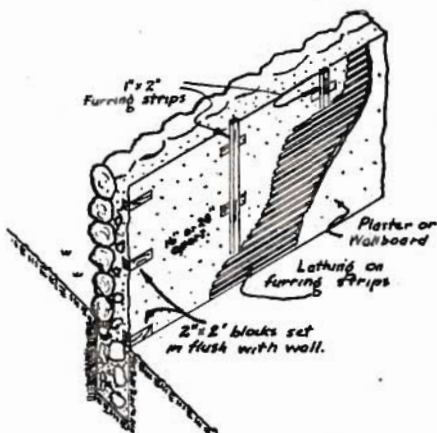


Fig. 6.—This type of wall is recommended for dwelling house construction.

### Building an Insulated Wall

In buildings where artificial heat is to be used or where uniform temperatures are desired, an insulated wall should be built. A simple method of building an insulated wall is shown in Figure 6. No special forms are necessary and the same construction practices as described above are followed. Except that as the wall is being laid up, 2 by 2 by 4-inch blocks are laid in the wall next to the forms and are spaced sixteen inches or two feet apart horizontally and two feet apart vertically. A spike is driven in the top and bottom of each block to insure good anchorage in the wall. When the forms are removed the inside surfaces of these blocks are exposed and 1 by 2-inch strips are nailed vertically to those blocks. Now we have an inside surface which is the same as standard wood construction and across these furring strips lath and plaster or wall-board can be applied. This method gives a 1-inch air space which is a good insulator and which prevents a condensation of moisture on the inside wall. This is necessary if the inside walls are to be kept dry especially where artificial heat is used in the building.

### Mixing the Concrete for the Walls

The cobblestone wall is laid up in a mixture of concrete which is placed with a trowel or shovel or both for speedy work.

The mixture should be of such consistency as to permit rapid construction. A little experience will enable the builder to determine what the mix should be. It should be remembered however that not

more than  $4\frac{1}{2}$  gallons of water per sack of cement should be used with medium moist sand and gravel. The consistency of the mixture should be controlled by varying the amounts of aggregate and not by varying the amounts of water. If the sand and gravel is dry use 5 gallons of water and if dripping wet use only 4 gallons. The above mix will be approximately 1 part cement,  $2\frac{1}{2}$  parts sand, and  $2\frac{1}{2}$  parts gravel. The sand and gravel should be clean and the largest particles should not be over  $\frac{1}{2}$ -inch in size. If larger particles are present, time will be saved in laying up the wall by screening the sand and gravel through a  $\frac{1}{2}$ -inch screen. If the sand-gravel is dirty and there is some question as to its desirability, it can be tested by putting about 2 inches of the aggregate in a quart fruit jar and fill with water. Shake well and allow to stand until the water clears up and if the film of fine sediment which has collected on top of the sand-gravel is over  $\frac{1}{8}$  inch thick the aggregate is unfit for use and should be washed or another source of supply found.



Fig. 7A.—Gauging thickness of wall. Trowel is used to measure distance from face of form to outer face of wall.



Fig. 7B.—Using handle of trowel to insure space for mortar between stone and form. Rocks should not be jammed against form.

### Laying Up the Wall

In preparing the materials for cobblestone construction the supply of rock is sorted, for pieces of suitable size, color and shape. The rejected pieces can be used in the construction of the footings and foundation wall and can be worked into the cobblestone walls next to the forms and between the larger rock. This practice will save considerable concrete. However, care should be taken that no rock should touch the inside forms. To insure a definite minimum thickness of concrete on the inner side of the cobblestone wall the handle of the trowel may be used as a gauge and none of the stone placed closer to the wood forms than the thickness of the trowel handle. See Fig. 7B.

As each stone is laid it is lightly tamped into place and all crevices between the stones filled with concrete. Each stone must be carefully bedded in the mortar. The concrete between the stones and next to the forms is spaded and tamped well so as to insure a solid wall and a smooth inner surface when the forms are removed. See Fig. 8A.

#### Wall Thickness

The thickness of the wall is easily kept uniform, a simple method being to measure the distance with the trowel. See Fig. 7A. Take for an example the construction of a 10-inch wall in a barn. A mark would be made on the trowel handle 10 inches back from the point. At any time and any place the outside line of the wall can be determined by putting the point of the trowel against the form; and thus making the outside of the wall as straight as the form behind it. This method saves the trouble and bother of stretching a line.



Fig. 8A.—Tamping concrete. Use short broom handle or similar tamper to insure compact concrete.



Fig. 8B.—Raking out the joints. After mortar has hardened somewhat the surplus is raked off the face of the stone.

#### Exterior Finish

The appearance of the wall can be varied to suit the owner; though much depends on the type of materials. A rough wall can be made using rocks of irregular and jagged surfaces or a smooth wall can be obtained by selecting rock having flat or rounder surfaces. Further variation can be obtained by blending the various colors and by pointing with plain and colored mortar.

In general there are two ways to finish the outer surface of the walls. The two methods are commonly known as pointed and unpointed work. In the latter the surplus mortar is raked out of the joints with a trowel after it has hardened enough so as to not smear. By this method practically no mortar remains visible in the finished wall. See Fig. 8B. In

the pointed work the above procedure is followed but the joints which are raked out are filled with a special mortar which seals each joint. This special mortar is made by mixing one part cement to two or three parts of sand. Mineral coloring materials, finely ground and thoroughly mixed in the mortar, may be used to produce colored joints. The amount to be used will have to be determined by trial and only enough should be used to produce the color desired.

#### **Reinforcing**

Reinforcing rods are desirable in all cobblestone walls especially at the corners and over all openings such as windows and doors. The reinforcing at the corners should be placed at intervals of about two feet and should be continuous around the corner for at least two feet on each side. These rods should be placed in the outside one-third of the wall. The common old iron found on the average farm such as wagon tires, old sicklebars, etc., is suitable for this purpose. It should be clean and not too rusty. Old pipe is not suitable reinforcing material.

#### **Curing**

The proper curing of all types of concrete work is very important if maximum strength is to be obtained. If cobblestone walls are exposed to the sun and wind before hardening much of the water necessary for curing will evaporate and the walls will dry out. This condition will occur more when the movable form is used. To keep the walls moist and to guard against too rapid evaporation the wall should be sprinkled as soon as it has hardened enough to stand such treatment. The work should be kept moist during the early hardening period of about ten days. On most construction jobs too little water is used after the work has been completed.

#### **Other Construction Details**

Window and door openings are provided with sills and lintels as in other types of masonry construction. Frames for doors and windows, using either plank or box frames as required, are set in place and tacked to the inside form. It is good practice to nail a 1 by 2-inch strip around the outside of the frames midway between the front and back so as to insure solid anchorage and to prevent a crack from opening up, if the frame dries out after the building has been completed. It is a good practice to prime all wood construction such as window and door frames with linseed oil and white lead before they are placed in the wall. The plate for the roof should be securely anchored to the wall before the roof is constructed. This can be accomplished by placing bolts at intervals of about four feet in the wall as it is being finished. The plates are then anchored to these bolts and there is very little danger of the roof blowing off.

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